The application of physiology is centered around maintenance of homeostasis of an organism. In such that understanding complex dynamic processes of the influence of stressors on the organism and the various pathophysiology of deviations from homeostasis or balance.

Respiratory physiology of human gas exchange is cited ad nauseum in the scientific and medical literature and is considered accepted in the fields of science and medicine.

Disruption of homeostasis occurs with breathing unusual mixtures of gases, hyperventilation, hypoventilation, breath-holding, exercise, etc.Fundamentals of maintaining respiratory homeostasis involved in gas exchange are ventilation, diffusion, and circulation.

The nose and mouth are the gateways to the lungs for land vertebrates. There is no known history of a species that has begun to voluntarily or involuntarily obstruct, partially obstruct or filter the orifices to their airways and lungs. We have no biological history of such a species or how they would have adapted to or possibly survived such a novel practice.
Maintaining cardiorespiratory gas exchange requires adequate ventilation. One variable that determines pulmonary function is resistance to airflow on either inhalation or exhalation. Obstruction of normal air flow via a facial covering will hinder perfusion pulmonary capillary blood flow, diffusion of gases, transport of gases, and regulation of ventilation. Mask wearing also reduces nasal breathing and production of nitric oxide. Reduction in nitric oxide will reduce blood and gas exchange efficiency.

The Bohr Equation calculates the amount of dead space or amount of air that does not participate in air exchange. The more dead space a person has, the more challenging gas exchange will be. Resistance to airflow is one variable that will increase the dead space in a person's lungs and reduce their ability to to exchange gases efficiently. A mask will create resistance to airflow and will create more of a challenge, even for healthy individuals to exchange gases via the lungs. .

Metabolizing cells consume Oxygen and excrete Carbon dioxide. Most CO_2 is excreted via the lungs. Output CO_2 will not accurately reflect stored CO_2 but as by proxy measure the accumulated increased amounts inhaled daily will have negative, adverse consequences on multiple systems in the body including the brain, the heart, the lungs, the kidneys, and the immune system.

The human cardiorespiratory system evolved for maintaining homeostasis to supply metabolizing tissues 20-21% Oxygen and the removal of excess CO_2.

Excess CO_2 is considered anything above 0.03-0.04% (300-400ppm) of Carbon dioxide. Humans have evolved to breathe levels of 300-400PPM OF carbon dioxide for human survival and maintenance of homeostasis.

Maintenance of homeostasis with exposure to unusual mixture of air will challenge the person's blood circulatory system and gas exchange system. One's ability to manage challenges to air exchange depends on the individual's ability to adapt to stressors or overall physical health/fitness of that person. Some key factors include; current pre-existing conditions, blood chemistry such as RBC and Fe levels, lung functioning, immune functioning, CV fitness.

Inhaling CO2 at levels higher than 600 ppm has been documented to cause hypercapnia. hypercapnia, increased carbon dioxide in the blood caused by reduced ventilation, is widely recognized to be an independent risk factor for death. While mask-wearing, respiratory rates will increase to attempt to compensate for increased rebreathing of carbon dioxide, exacerbating the problem further.

Most health departments consider levels of carbon dioxide over 1000 ppm, unhealthy levels. Increasing carbon dioxide levels over 1000 ppm can lead to the following conditions; moderate to severely reduced mental performance, drowsiness, headache, labored breathing, and respiratory/metabolic acidosis, toxicity, unconsciousness, tachycardia, cardiac arrhythmia, convulsions, and death.

There has been extensive evidence proving the impact of carbon dioxide on cognitive functioning.

Harvard University - Center for Health and the Global Environment at the Harvard T.H. Chan School of Public Health on the Impact of CO2 Levels on Children's Cognitive Performance.
https://ehp.niehs.nih.gov/doi/full/10.1289/ehp.1510037

Carbon Dioxide and Cognitive Function:

- For seven of the nine cognitive function domains, average cognitive scores decreased at each higher level of CO2 .
- Cognitive function scores were 15% lower for the moderate CO2 day (~ 945 ppm) and 50% lower on the day with CO2 concentrations of ~1,400 ppm
- Activities performed in 600 and 1000 ppm of CO2 range from good performance to average. Those performed at 2500 ppm performed 40% WORSE.
- Classrooms that are not properly ventilated could have CO2 levels reaching beyond 3000 ppm, compared to the healthy level of 1000 ppm. With CO2 levels that high, students could experience up to an 80% decrease in cognitive functions.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4892924/?fbclid=IwAR2gRuiqfaKO7e00uL5B3dG9J7_Qv9bs-nRSvYY0LkxXEIv0O12Hxu6V6KQ

https://pubmed.ncbi.nlm.nih.gov/23008272/

Pennsylvania State University: The relationships between classroom air quality and children's performance in schooL.
https://www.sciencedirect.com/science/article/abs/pii/S0360132320301074

- Quantitative relationships were created between CO2, ventilation rates and performance of schoolwork.
- There was a direct relationship between CO2 levels and cognitive performance.

University of Pennsylvania and Colorado University: Atmospheric CO2 levels can cause cognitive impairment.

https://www.news-medical.net/news/20200421/Atmospheric-CO2-levels-can-cause-cognitive-impairment.aspx

- Carbon dioxide levels at 1400 ppm reduce basic decision-making ability by 25 percent, and complex strategic thinking by around 50 percent.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3548274/?fbclid=IwAR1RXd1pIgKN_TgmslKf8tEkI0ckY96ZVBZy4AdJ52RglJyG2L6UUxYsMb0

EPA Reference Guide for Indoor Air Quality in Schools:

https://www.epa.gov/iaq-schools/reference-guide-indoor-air-quality-schools#IAQRG_Section1

Ventilation-Related Regulations

Many state and local governments do regulate ventilation system capacity through their building codes. Building codes have been developed to promote good construction practices and prevent health and safety hazards.

Professional associations, such as the American Society of Heating, Refrigerating and Air-Conditioning Engineers **(ASHRAE)** and the National Fire Protection Association (NFPA), develop recommendations for appropriate building and equipment design and installation (e.g., ASHRAE Standard 62-2001, "Ventilation for Acceptable Indoor Air Quality").: Using CO_2 as an indicator of ventilation, **ASHRAE has recommended indoor CO_2 concentrations be maintained at—or below—1,000 ppm in schools and 800 ppm in offices.**

https://www.ashrae.org/technical-resources/bookstore/standards-62-1-62-2

http://www.energy.wsu.edu/documents/co2inbuildings.pdf

CO_2 concentrations above 1500 ppm were associated with increased prevalence of certain mucous membranes and lower respiratory sick building syndrome (SBS) symptoms. These health outcomes include SBS symptoms such as nausea, headaches, nasal irritation, allergy and asthma symptoms, rapid breathing, dry throat, and respiratory illnesses.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4515331/

Other mask risks: increased risk of respiratory infections, various bronchopulmonary diseases, such as asthma, alveolitis, chronic bronchitis, bronchiectasis, fibrosis, spontaneous pneumothorax, and chronic pneumonia.

Randomized control trials (RCT) of cloth masks and the results of such studies caution against the use of cloth masks.

Some of the important findings of mask RCTs are as follows; moisture retention, reuse of cloth masks, and poor filtration may result in an increased risk of infection, increased inhalation of cotton fibers and other synthetic materials, deeper and more forceful breathing occurs, and microscopic examination of the face side of newly unpackaged, never worn masks, there can arise the risk of a dangerous level of foreign material entering lung tissue. Research on synthetic fibers has shown a correlation between the inhalation of synthetic fibers and various bronchopulmonary diseases, such as asthma, alveolitis, chronic bronchitis, bronchiectasis, fibrosis, spontaneous pneumothorax, and chronic pneumonia. Numerous studies found bioburden on each type of mask studied, even after first use in a surgical environment.

Health Canada released a statement on the risks and hazards of inhalation of graphene nanoparticles found in most paper masks.

https://www.nanowerk.com/nanotechnology-news2/newsid=57716.php?fbclid=IwAR2slY3EmXJ-ZQh_ce_wWtUg28Epw6Qrp_w1HOFomiBdby0UvEbUhh8h8zA.

LIst of supporting studies:
https://www.ormanager.com/briefs/university-of-louisville-study-finds-mask-mandates-did-not-slow-spread-of-covid-19/?fbclid=IwAR13-Nlht5LAn6fo9zg7sh0kqtlBsYu9RnD3OX8EUBMP4Qpx5PYbPLrD8OQ

https://www.medrxiv.org/content/10.1101/2021.05.18.21257385v1.full.pdf

https://pubmed.ncbi.nlm.nih.gov/18500410/

https://clinicaltrials.gov/ct2/show/NCT00173017

https://bmjopen.bmj.com/content/5/4/e006577

https://www.isrp.com/the-isrp-journal/journal-public-abstracts/1154-vol-27-no-1-2010-pp-27-51-wiliams-open-access/file

https://pubmed.ncbi.nlm.nih.gov/23008272/